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analyses, such as would have contented most writers, while chemical analyses are often needed to establish the identity of a species. The broader study of the *origin of species* can be done by close observation alone.

The attention of our younger mineralogists should be particularly called to the value of a full description of the *associations* of minerals. The selected specimens in our cabinets, from which all "dirt" has been removed can teach us nothing of their origin. It is the rough masses in their natural home, interpenetrated by more recent minerals, or occurring in veins in those which are older, which, with their products of decomposition, are most worthy of study, both macroscopically and microscopically. A study of mineralogical development may finally lead to a new basis of classification, such as has already been attempted in lithology.

A MOUNTAIN OF MARTITE.—An iron mountain, the Cerro de Mercedo, which rises abruptly out of the plain near the city of Durango, Mexico, and which, a mile in length, is so covered by masses of iron ore as to conceal all rock outcrops has been reported upon by Mr. John Birkenbine, and the ore further described by Professsor B. Silliman. The ore has the streak and composition of hematite, but the octahedral character of the crystals showed it to be martite, and it is probable that the whole mass has been altered from magnetite.

ANALYSIS OF HELVITE.—Mr. R. Haines contributes to the Franklin Institute Journal, a correction of his analysis of the Helvite, from Amelia Co., Virginia, found by the writer and first recorded in the April NATURALIST. A re-examination of the specific gravity showed his first determination to have been erroneous, owing to the small amount of material at hand. It is now found to be 3.29. A new analysis gave total SiO , 32.49 per cent. of which 5.17 per cent. was insoluble in sodic carbonate, and is regarded as gangue. The full analysis was not completed.

GEOGRAPHY AND TRAVELS.[1]

PROCEEDINGS OF THE GEOGRAPHICAL SECTION OF THE BRITISH ASSOCIATION.—The meeting of the British Association for the Advancement of Science, this year, was held at Southampton, from August 23d to 30th.

The subject of the opening address of the president of the Geographical Section, was the Central Plateau of Asia.

"This area," he said, "which is one of the most wonderful on the surface of the earth, contains nearly 3,000,000 of English square miles, and is equal to three-fourths of Europe. Its limits, its exterior configuration, its central and commanding situation in the Asiatic continent, will be clearly perceived from the large diagram of Asia which is exhibited here. As compared with some of the more favored regions, it is singularly destitute of natural advantages. Though it has several deep depressions of surface, yet its general elevation is very considerable, and some of

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[1] Edited by ELLIS H. YARNALL, Philadelphia.

> its large districts are the most elevated in the globe. It is walled in from the outer world and excluded from the benign influence of the sea by mountain chains. Its climate then is very severe on the whole, more distinguished for cold than for heat, but often displaying extremes of temperature high as well as low. It offers from the character of its contour, extraordinary obstacles to communication by land or or water. Though seldom inaccessible to courageous explorers, it is generally hard of access, and in several respects very inhospitable. In the progress of civilization it is, with reference to its historic past, excessively backward. Its capacities for the production of wealth have been but little developed. Its population is scanty, scattered, and uncultured. Its agriculture comprises only a few areas widely segregated from each other, and many of its largest districts are amazingly desolate. Nevertheless this plateau has eminent claims on the attention of geographers, for several reasons, which may be summarized thus :—1. A mountain system which dominates the greater part of Asia, and includes stupendous ranges with the loftiest peaks yet discovered in the world. 2. A series of heights and depressions almost like the steps of a staircase within the mountainous circumvallation of the plateau. 3. The sources and the permanent supply of rivers which, passing from the plateau, flow through densely populated regions, and help to sustain the most numerous families of the human race. 4. A lacustrine system, comprising lakes, of which some are saline while others have fresh water, and of which many are situated at great altitudes. 5. The home of conquering races, whence warrior hordes poured during several centuries over nearly all Asia and a large part of Europe. 6. Natural products of value, variety, or interest, and pastoral resources susceptible of indefinite development. 7. An enormous field for scientific research, with many regions which, though not wholly undiscovered, yet need much further discovery. 8. An imperial jurisdiction offering many problems for the consideration of social inquirers."

The consideration of these points in detail occupied the remainder of Sir R. Temple's address.

Mr. John Ball discussed some points of the physical geography of South America, and especially the "remarkable contrast that exists between the climate of the eastern and western sides of the continent. On the eastern side of the great range of the Andes, which extends from north to south, a distance of more than 3500 English miles, you find throughout the vast empire of Brazil, from some degrees north of the equator to the tropic of Capricorn, copious rains which maintain extraordinary fertility and the full luxuriance of the tropical fauna and flora. On the opposite or western side, the tropical climate, with its characteristic vegetation, extends to the Pacific coast from the Isthmus of Panama to the Bay of Guayaquil. But the headlands which mark the southern limit of that bay—Capes Parinas and Blanco—also mark a sudden and complete change of climate. From the latter cape, lying about five degrees south of the equator, the comparatively narrow strip of land lying between the Andes and the Pacific coast—for a distance of fully 1500 miles—lies in what has been called the rainless zone of Western South America." Again, "in the southern province of Brazil and thence southward to the estuary of the Plata, the climate shows a gradual transition from the moist tropical type to the dry character of the *pampas* region, which in a more marked degree prevails in the south of the Argentine territory and through Eastern Patagonia. Exactly an opposite change occurs on the western side. In Chili, from Copiapo, where rain is rare and insufficient, to Valdivia, where it is excessive in amount, there is, as you travel southward, a gradual and steady increase in annual rainfall, with a corresponding change in the vegetation. The coast south from Valdivia, extending throughout Western Patagonia to the western end of the straits of Magellan, is apparently the part of the earth out of the tropics where the annual rainfall is greatest."

At Tumbez, on the south side of the Bay of Guayaquil, are frequent heavy rains and a mean temperature of about 82° F., with rich tropical vegetation; whereas at Payta, scarcely a hundred miles distant, no rain falls for two years at a time, and the average temperature is much lower than at Tumbez, while the coast is absolutely bare of vegetation.

The mildness of the climate, and especially of the winter climate, of the straits of Magellan is also without adequate explanation.

Mr. Joseph Thomson read a valuable paper on the Geographical Evolution of the Tanganyika Basin.

The various stages in the evolution of the Tanganyika Basin were summarized as follows;—"The first appearance of the future continent, we have been led to believe from various theoretical considerations, was the appearance of a fold of the earth's crust bounded by two lines of weakness converging towards the south, which fold gradually rose till it appeared above the ocean, first along these two lines of weakness, in the form of a series of islands, which finally join, enclosing in their centre a large part of the ocean. This enclosed water area formed a great central sea, and the enclosing land along the line of weakness is now indicated by the east and west coast ranges. In the second stage the continent of Africa south of 5° N. latitude presented the outline of the continent of to-day. The third stage shows the central plateau with the great central sea very much diminished in size and almost coinciding with the present Congo Basin. There is as yet no evidence of the existence of Tanganyika. After an enormous period of undisturbed deposition of sand in the sea, the fourth stage is ushered in by a period of great continental convulsions. On the line of the future Tanganyika a huge boss of rock is intruded into the throbbing crust, and the surrounding region elevated to a considerable extent, followed by the subsequent collapse of the body of the elevated area originating the great abyss of Tanganyika. The fifth great stage is marked by the formation of a channel through the western coast mountain causing the draining of the great central sea, which immediately becomes the inner drainage area of the Congo. The sixth stage then sees Tanganyika isolated as a lake by itself, from which time dates the moulding of its present scenery, the formation of an outlet, the freshening of its waters, and the lowering of its level; and, finally, we have seen that the intermittency of the lake's outflow is explained by the probable fact that the rainfall and evaporation nearly balance each other in ordinary seasons."

One of the most learned and elaborate papers was by M. P. deTchihatchef, on the Deserts of Africa and Asia.

After treating at length of the geology and physical changes of the desert of Sahara, he gives the following resumé of the most prominent features in its geological history:—

"1. The records of this history are very old, for the southern regions of the present Sahara were represented during the Devonian period by a certain number of isolated masses of limestone, gneiss, and micaschiste, the limestone containing Devonian fossils. Those masses conserved through all the succeeding ages their insular position, and never sunk again under the sea. 2. It was during the Cretaceous epoch that a large portion of the present Sahara was upraised under the shape of variously ramified masses, so that the sea of the following geological periods could penetrate into their interior, forming numerous gulfs and bays. 3. The Sahara was represented until the Quaternary epoch chiefly by those cretaceous masses which since their upheaval have never been covered by the sea.

"During the Quaternary period, among the gulfs which washed the shores of the cretaceous land, the largest occupied the present country of Jgharghar; the northern extremity of that gulf reached the place of Biskra, and the southern the cretaceous plateaux of Tademayt and Tinghert; the town Uargla occupies almost the central part of the gulf. As from the north, the last was entirely secluded from any communication with the sea, the littoral part of Algeria having been upraised a long time before, and consisting then, as now, in more or less high mountains, the large quaternary gulf could not find any other way in the interior of the Saharian cretaceous continent than through the present gulf of Gabe; and what proves that here was really the entrance of the quaternary gulf, is the narrow strip of diluvial deposits which, surrounded by cretaceous rocks, extends from Gabes unto the salt lake of El-Fedjedj (Tritonis lacus). This geological fact is important in reference to the question, so long discussed, of the ancient communication between the lake and the sea; it confirms the hypothesis of Commander Roudaire, and I am not aware that this argument, which I consider as the strongest of all, has ever been urged in his favor. The upheaval of the quaternary large gulf (and of many other smaller ones) was the last marine phasis which the Sahara underwent. 4. Once entirely raised up in all its parts, the Sahara had still to undergo a subaerial operation which consisted in the formation and accumulation of sands. It closes the fourth and last stage of her long geological history, without speaking of the different climatic and topographical modifications of quite recent times. This history, as it has been shown, proves that there can be no longer question of a recent emersion of the whole Sahara from the bottom of the sea. It is true the Libyan desert is probably somewhat younger than her Saharian sister, for tertiary uncovered deposits (Eocene and Miocene) have there a larger development than the Cretaceous ones; but, even admitting that the Libyan desert has been upraised after the Miocene period, it cannot be called recent."

As regards the great desert of Asia—the Gobi, there is abundant evidence to show its ancient formation, and it is "probable that after its upheaval this large surface has never been overflooded by the sea, as little as the Sahara-Libyan desert since the Cretaceous and Tertiary periods, or the Turkestan deserts since the Palæozoic epoch. Once more, in the Gobi, as in the other two deserts, the sand accumulations had nothing to do with marine deposits; they were chiefly produced by atmospheric agencies, and, as far as the Gobi is concerned, the frequent silicious rocks, as granite, syenite, gneiss, &c., were particularly apt to yield sufficient materials to the formation of quartz sands. It is superfluous to add that the upheaval of those deserts did not take place at once, but successively, as we have seen in the Sahara-Libyan desert, where Cretaceous and Tertiary rocks appeared, the one after the other, leaving still large tracts occupied by sea or fresh water basins, which were filled up only during the Quaternary epoch, or even in a more recent one. Therefore it is highly probable that, like the Sahara-Libyan desert, the Asiatic deserts were also crossed, long after the upheaval of their chief portions, by gulfs, or contained numerous fresh water basins."

The Geography and Meteorology of Kansas was treated of by Dr. Litton Forbes. It would be impossible perhaps, to find a country of equal extent where the physical changes produced by the advent of civilization have been so numerous or so important. Not only has the fauna been in great part changed, but the flora also, as well as the amount of rainfall and the general hygrometric conditions of the atmosphere. Not merely has the number of inches of annual rainfall increased, but it has also been more equitably extended over a larger extent of country. The progression westward of the rainfall of Kansas, in proportion as settlement has extended westward, is a most important fact. It may be due in part to the planting of timber, but is probably much more directly dependent on the immense acreage under wheat, corn, and other crops, which afford protection to the earth from the sun's rays, and so check a too rapid evaporation.

The State of Kansas forms a rectangular parallelogram, which measures about 400 miles from east to west, and about 200 from north to south, and contains over 82,000 square miles. Though to the eye apparently one vast, level plain, it is really a more or less elevated plateau, which slopes eastward at an appreciable angle. The highest, or western portion of the State, is about 4000 feet above the level of the sea, while the average height of the whole country may be placed at about 2375 feet. The main water course is the Arkansas river, which has a fall of about six feet in the mile. In spite of the absence of hills, Kansas is singularly free from marshland or swamps. This is due, in part, to the friable nature of the soil, and in part to the natural slope of the land towards the east. What is known as the "Great Arkansas Valley of South-western Kansas," embraces a width of fifty miles, nearly the whole of which is sloping upland. The soil here is a sandy loam, of alluvial origin, and of great depth and fertility. A remarkable peculiarity of the Arkansas river is that it never overflows its banks, but, so to say, underflows them. The water filters through the gravelly stratum underlying the surface-soil of the valley, and may always be found by digging for it. From a meteorological point of view, Kansas may be said to be divided into three distinct zones, marked off by the amount of rainfall. In the extreme east the rainfall assimilates itself to that of Missouri, and is ample for all purposes of agriculture. In the middle zone, which may be said to lie in Central Kansas, the rainfall is less, yet amply sufficient for all purposes of farming or pasturage. The vegetation here is extraordinarily profuse, and is sub-tropical in character. The third and last zone lies in the western and south-western portions of the State. Here the climate resembles that of Colorado, and the rainfall is insufficient for agriculture, though sufficient for grazing purposes. It would seem, however, that the limits of the zone of moderate rainfall are constantly proceeding westward as civilization advances. Twenty five years ago the frontier of agricultural production was placed at about the ninety-sixth degree of west longitude. Ten years later it had advanced to the ninety-seventh, five years later to the ninety-eighth, while to-day it may be said to extend to the one hundredth. Along with this advance the character of the flora of the country has appreciably changed. The "blue stem" grass and other plants, which require moisture, have displaced the buffalo or "gramma grass," which is the natural covering of the great plains. Whether the procession westward of the rainfall will continue as heretofore, once it has reached the meridian of 100°, may fairly be open to question. The prevailing winds from May to September are from the south and south-west. But inasmuch as the western limit of the Gulf of Mexico is in the ninty-eighth meridian, it follows that these winds must blow over the arid and thirsty soil of Mexico, and will contain therefore but little moisture. Hence this western part of Kansas must long continue to be an essentially dry country. Cultivation may no doubt modify the climate, but the process will be slower and more difficult than in Central Kansas.

POGGE AND WISSMANN.—Letters have been received from Dr. Pögge, dated November 27, 1881, written at Mukenge, the residence of the chief of the Tusselanga in about 6° S. lat. and 22° 22′ 10″ E. long. (Greenwich). The travelers had, in turning the territories of the Muata Yanvo, been obliged to take a north-easterly direction and after forty-four days' march from Kimbunda crossed the Kassai on the 21st of October. The Kassai at this point had a width of about 350 yards. Here Wissmann separated from his companions and started in a southerly direction, whilst Dr. Pögge took a northerly course towards the territory of the Tusselanga, reaching on the 30th of October, the residence of the chief Kalamba Mukenge. This place, with its well built huts and population of about 1000 souls, lies between the sources to two rivulets flowing towards the Lulua, and having excellent drinking water, and would form a capital site for a station if the Lulua should prove available for water communication with the yet unknown regions beyond. But it appears that this river, notwithstanding its breadth of more than 300 yards, is very shallow and full of rapids. Pögge describes the country as fertile; every where madioca, maize, millet, and beans are cultivated, and the four kinds of oil palms, which grow chiefly in the forests, are seen planted in the cultivated fields. Of game animals occur only the wart-hog and a small species of Cape buffalo, but the rivers are full of hippopotami and the woods of various species of *felidæ*. The grey parrot is also found here. The climate is warmer than in the Muata Yanvo's country, but everywhere salubrious and the natives are friendly and peaceable. The chief articles of trade are slaves, especially female, and india-rubber; ivory being little dealt in. The chief market for ivory lies some eight days' journey to the N. N. W. of Mukenge at a place called Kabao, in the Tukette country.

With regard to his further movements, Dr. Pögge hoped to leave Mukenge on the 29th of November and to cross the Lulua and meet Lieut. Wissman in Bacua-Carimba. Both would then, under the protection and guidance of the chief Kalamba-Mukenge, travel eastward as far as the Lake Mukanga, distant ten days march, and then onward six days march to the Mobondi-Stani, further two days' march to the Lubilash river, and two days beyond that, to the great Mobondi chief Fumo-Kole. As far as that point only was the traveler able to obtain information regarding the route. Should no insuperable obstacle be encountered, the travellers would travel along the trade road leading to Nyangwe on the Lubilash (the upper course of the Congo,) reaching which place Pögge would return to Mukenge whilst Wissmann would strike for Zanzibar. Pögge calculates that his journey to the Lubilash and back to Mukenge will take six months.

AFRICAN EXPLORATION.—The Royal Geographical Society has decided to send a new exploring expedition to Africa under the command of Mr. Joseph Thomson. After organizing his company at Zanzibar, Mr. Thomson will proceed from Mombas on the East African coast to Mount Kilimandjaro, and after ascending this celebrated peak, he hopes to advance through an entirely unknown region to the shores of the Victoria Nyanza, returning to the coast by a more northerly route so as to visit, if practicable, Lake Baringo and Mount Kenia.

Lieutenant Giraud, a young French naval officer, has sailed from Marseilles for Zanzibar. He intends to go either to Lake Tanganyika, or more probably by the north shore of Lake Nyassa, to the Chambeze River. He will follow this stream to its outlet in Lake Bangweolo, which he proposes to circumnavigate. He then hopes to descend the Lualaba-Congo to the sea.

The French Government has decided against the scheme of M. Roudaire of flooding a portion of the Sahara, considering that the cost will exceed the advantages to be gained.

Professor Guido Cora in an address before the Italian Geographical Society, describes the Desert of Sahara as an immense tract of country, with a mean elevation of from 1300 to 1650 feet above the level of the sea, in which sand does not occupy more than one-fifth of the entire area, and where large chains of mountains are found attaining a height of from 6550 feet to 8200 feet. In some parts it only rains once in some twenty years, while in others there is a regular rainy season; the temperature there rises to 122° F. and falls to 19° 4′ F., and the loftiest mountain tops are covered with snow and ice for several months in the year. The fauna and flora have a special importance. Lastly, the Sahara has a population of some 3,000,000, and contains towns of from 5000 to 10,000 inhabitants. It has a total area of 3,700,000 square miles, stretching on the north to the Great Atlas and the Mediterranean, between the two Syrtes to the south of Cyrenaica and Lower Egypt; on the east it is conterminous with the Valley of the Nile; on the south it is bounded by a line running from El Obeid to Lake Chad, to the middle course of the Niger, and the lower part of the Senegal; and lastly, on the west it reaches the Atlantic Ocean.

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MICROSCOPY.[1]

TAYLOR'S FREEZING MICROTOME.—All who are familiar with the exquisite sections of soft tissues, sometimes cut by the various freezing microtomes, and at the same time have had experience of the troubles, uncertainties and delays (if not dangers) of pack-

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[1] This department is edited by Dr. R. H. WARD, Troy, N. Y.